UNIVERSIDADE DA CORUÑA

MASTER IN SCIENCES, TECHNOLOGIES AND ENVIRONMENTAL MENAGEMENT

FACULTY OF SCIENCES

MASTER´S THESIS

ACADEMIC YEAR 2015 - 2016

Modern physico-chemical analysis of drinking water from Ceyranbatan reservoir (Azerbaijan)

Análisis físico-químico actual del agua potable en el embalse de Ceyranbatan (Azerbaiyán)

Análise físico-químico actual da auga potable no encoro de Ceyranbatan (Azerbaiyán)

Student´s name: Ismayilova Nigar Vidadi q.

Name of Academic Tutor (UDC): Prof. Soledad Muniategui Lorenzo.
Name of Academic Tutor (BSU): Prof. Hajiyeva Sevinj Rafiq q.

BAKI DÖVLƏT UNİVERSİTETİ 1919

May 2016

RETHINKe

Co-funded by the Tempus Programme of the European Union

SUMMARY

For the normal life and health of the population of each country becomes important at the present time, the quality and ecological assessment of water. Water is essential for normal physiological processes of the body. Due to the need to identify specific physico-chemical parameters of water and to carry out a comprehensive assessment of the state of drinking water in Absheron region in Azerbaijan, as research object was chosen the Ceyranbatan reservoir. The study was conducted to evaluate the chemical composition, as well as its compliance with drinking water quality standards.

The structure of the thesis consists of an introduction, four chapters and conclusions. The first chapter is devoted to water, its composition and its effects on human health. In the second chapter deals with standards and hygienic requirements for drinking water quality. The third chapter deals with diseases caused by chemical composition of water.

The fourth final chapter focuses on the physical-chemical water reservoir Ceyranbatan research, determining more than forty parameters including heavy metals. Effect of the water purification treatment in certain parameters was studied, analyzing the water before and after the cleaning treatment, in autumn and winter. Water samples analyzed comply with all standards and hygienic requirements for the quality of drinking water, demonstrating a highly efficient operation of the Ceyranbatan water treatment plant.

RESUMEN

Actualmente se considera de gran importancia la calidad y la evaluación ecológica del agua para la vida normal y la salud de la población un país. El agua es esencial para los procesos fisiológicos normales del organismo. Este trabajo fin de master plantea como objetivo principal de investigación la necesidad de identificar los parámetros físico-químicos específicos y realizar una evaluación exhaustiva del estado del agua potable en la región de Apsherón en Azerbaiyán, para lo cual se seleccionó el embalse de Ceyranbatan. En el trabajo se estudió la composición químicadel agua, así como el grado de cumplimiento de los estándares de calidad del agua potable.

La estructura de la tesis de master consta de una introducción, cuatro capítulos y conclusiones. El primer capítulo está dedicado al agua, su composición y sus efectos sobre la salud humana. El segundo capítulo se ocupa de las normas y requisitos de higiene para la calidad del agua potable. El tercer capítulo considera las enfermedades causadas por la composición química del agua. El cuarto capítulo final se centra en la investigación físico-química del agua del embalse Ceyranbatan, determinando más de cuarenta parámetros, entre los que se encuentran los metales pesados. Se estudió el efecto del tratamiento de potabilización del agua en los parámetros determinados, analizando el agua antes y después del tratamiento de limpieza, en otoño e invierno. Las muestras de agua analizadas cumplen con todas las normas y requisitos de higiene para la calidad del agua potable, demostrando una operación altamente eficiente dela potabilizadora de Ceyranbatan.

RESUMO

Actualmente considérase de gran importancia a calidade e a avaliación ecolóxica da auga para a vida normal e a saúde da poboación dun país. A auga é esencial para os procesos fisiolóxicos normais do organismo. Este traballo de fin de máster expón como obxectivo principal de investigación a necesidade de identificar os parámetros físico-químicos específicos e realizar unha avaliación exhaustiva do estado da auga potable na rexión de Apsherón en Azerbaiyán, para o que se seleccionou o encoro de Ceyranbatan. No traballo estudouse a composición química da auga, así como o grao de cumprimento dos estándares de calidade da auga potable.A estrutura da tese de máster consta dunha introdución, catro capítulos e conclusións. O primeiro capítulo está dedicado á auga, a súa composición e os seus efectos sobre a saúde humana. O segundo capítulo ocúpase das normas e requisitos de hixiene para a calidade da auga potable. O terceiro capítulo considera as enfermidades causadas pola composición química da auga. O cuarto capítulo final céntrase na investigación físico-química da auga do encoro Ceyranbatan, determinando máis de corenta parámetros, entre os que se atopan os metais pesados. Estudouse o efecto do tratamento de potabilización da auga nos parámetros determinados, analizando a auga antes e despois do tratamento de limpeza, no outono e no inverno. As mostras de auga analizadas cumpren con todas as normas e requisitos de hixiene para a calidade da auga potable, demostrando unha operación altamente eficiente da potabilizadora de Ceyranbatan.

OBJECTIVES

- The main objective of this work was to carry out physical and chemical water quality assessment of the- Ceyranbatan reservoir, located near the urban village of Ceyranbatan in Absheron peninsula.
- The reason for choosing the theme "Modern physico-chemical analysis of drinking water from Ceyranbatan reservoir" was to explore highly toxic heavy and other metals, which pose a threat to human health using the most modern equipment such as "ICP-MS" In addition, other important traces compounds in drinking water were also considered.
- Establish compliance water of Ceyranbatan water reservoir with drinking- water quality standards.

INTRODUCTION

For the purpose of evaluating the physical and chemical quality of drinking water of Ceyranbatan reservoir was carried out physical and chemical analysis before and after incoming of water in the water purification plant. Trials were carried out during 2015-2016 years in the autumn and winter periods**.**

Reservoir characterization

Ceyranbatan reservoir (Azerbaijani: Ceyranbatan su anbarı) is a reservoir in the Absheron Rayon in eastern part of Azerbaijan. It is located between Baku and Sumgayit cities, next to Ceyranbatan settlement 20 km away from Baku. In Azerbaijani Ceyranbatan means "the place where the gazelle has drowned" which refers to an ancient legend related to the naming of city of Sumgayit.

Ceyranbatan reservoir

The reservoir was built in 1958 in order to provide drinking water to increasing population of Baku and Sumgayit. The overall area is 13.9 km^2 (5.4 sq mi),volume of reservoir is 186 million m3, 150 million m3 is utilized. Length of the reservoir is 8.74 km (5.43 mi),

maximum width is 2.15 km (1.34 mi), the shoreline length is 23.3 km (14.5 mi). The maximum depth of water in the reservoir is 28.5 m (94 ft) with the lowest depth registered at 14.5 m (48 ft). The water surface area is 1,389 ha (13.89 km2). The reservoir gets the water from Samur-Absheron channel which is fed by three inflowing rivers Samurçay, Vəlvələçay and Qudiyalçay. Due to containment of drinking water, a sanitary protection zone was founded around the reservoir in 1960. In 2001, the first sanitary zone was expanded and fenced off for protection of the reservoir lake. The project also included foresting and cleaning of water channels in order to improve the ecology of the lake.The fence is 23 km (14 mi) long. The reservoir also has two sets of big water pumping stations.

Ceyranbatan water treatment plant

Ceyranbatan water treatment plant the world's surface largest UltraFiltration plant. Modern water treatment plant based on ultrafiltration technology. The ultrafiltration instalation holds the sand, dust, clay, bacteria and all substances larger than 0.01 microns. Only after clearing the water, which is sent to the barn introduce chlorine in order to disinfect water from bacteria that can pose a threat to the human body.

This water treatment plant with a capacity of 6.6 cubic meters per second and 570 000 cubic meters per day is the uninterrupted supply of water to the population.

DESCRIPTION OF THE PLACE WHERE THE PRACTICE HAS BEEN MADE

Central Laboratory

I want every city and village be supplied
with drinking water on "24 hours a day" basis…
Water provided and will be provided to the Azerbaijan population
must be adapted to the standards of World Health Organization.

Ilham Aliyev

History

The construction of a new office building of the central laboratory of "Azersu" Open Joint Stock Company launched later in 2011. The new building covering an area of 1,800 square meters consists of drinking water and sewage sections. Each of the sections has departments for microbiology, physical and chemical analyses.

The laboratory is fitted with equipments manufactured by leading international companies of Germany, USA, Japan, and other countries. The equipment enables determination of physical, chemical and bacteriological properties of drinking water. 138 parameters including 84 parameters of drinking water, 54 parameters of sewage are determined in the new laboratory.

The most sophisticated laboratory of the region operates the “ICP-MS” equipment, which allows the company to determine highly toxic heavy and other metals, which pose a threat to human health.

The microbiology analysis room of the laboratory is responsible for detecting dangerous bacteria.

The sewage section of the laboratory conducts both physical and chemical analyses. The laboratory is particularly important from the standpoint of public health and environmental protection. The laboratory is expected to analyze water samples from a total of 1,800 addresses, including water sources, water treatment installations, water reservoirs, educational, healthcare and catering facilities, as well as individual consumers.

The new laboratory has also provided the opportunity for conducting analyses throughout the republic. In order to do that, two field laboratories and four special vehicles have been purchased for the transportation of water samples. The field laboratories are currently conducting analyses of water samples taken in district centers and villages.

The results of the analysis will be accepted at the international level (European Union and the World Health Organization) once the laboratory is accredited under İSO-17025.

The new laboratory is located in Baku city Yasamal district, Akim Abbasov str. 110.

MATERIAL AND METHODS

Procedure selection of samples

Sampling for physical and chemical analysis

For physical-chemical analyzes of samples

The selection procedure is carried out in accordance with the " TS EN ISO 5667-3,5,14 Sampling" standard. The analyzed parameters are selected in advance. Samples are taken in accordance with the F-073 "Select number of utensils and, transportation and storage of samples, depending on the parameters analyzed drinking water." Before sampling the bottle at least two times should rinsed with water and filled so that air bubbles do not remain the air. When sampling from rivers, lakes, etc. use the special elongated sampler and samples are taken from a depth of 30 cm and a distance of 1 m.

Methods of analysis

I. Physical analysis

1. Determination of color (The color of water is determined by the presence of humic substances and iron compounds. Color determined by the scale of standards)

2. The determination of odour (To determine the necessary temperature of 20-60 C^0.For drinking water odour should not exceed 2 points.)

3. Determination of turbidity.(The turbidity is determined using apparatus Turbidimetr HACH -2100AN. Method -SM 2130 B)

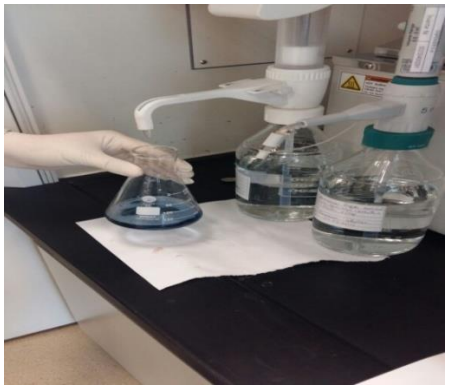
4.Determination of pH (Potentiometric determination of ph using ph meter. Method-SM 4500-H*B)

5. Determination of conductivity (The conductivity is determined using apparatus conductometer HACH Sensions ™ 5. Method-SM 2510B)

II. Chemical analysis.

6.Titrometric determination of total alkalinity, carbonate and bicarbonate ions(Method-SM 2320B)

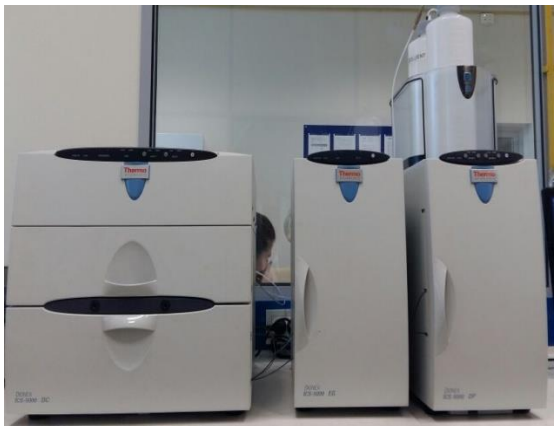
7. Titrometric determination of total hardness (Method-SM 2340)



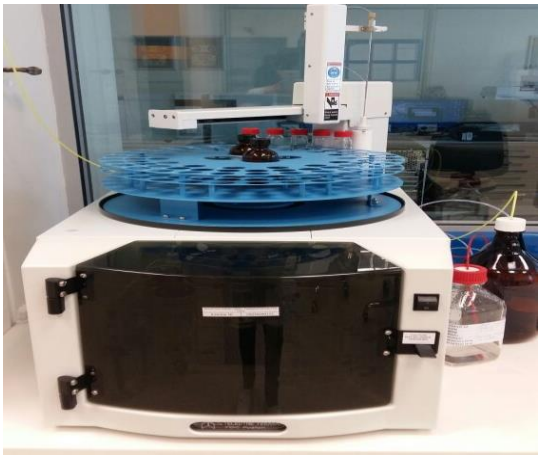
8.Determination of heavy metals (Heavy metals are determined using apparatus İCP-MS Agilent 7700e, ICP-MS- Inductively Coupled Plasma Mass Spectrometer.

Method- SM 3120)

9. Determination of anions and cations by Ion Chromatography (Anions and cations are determined using apparatus Ion Chromatograph inventory №00230400185. Methods- 4110B, 3120B).



10. Determination of TOC-Total Organic Carbon by using apparatus MSWS TOC Agilent. Method-SM 5310).



RESULTS

Trials were carried out during 2015-2016 years in the autumn and winter periods**.**

Sampling in autumn period

Results before cleaning: 24.09,2015

PARAMETER	Unit	Result	method	QUALITY REQUIREMENTS	
				98/83 EC Directive	QOST 2874-82
pH	**pH** (pH unit)	**8,7**	**SM 4500-H*B**	6,5-9,5	**6,0-9,0**
TURBIDITY	**NTU**	**1,8**	**SM 2130 B**	1	**1,5 mg/L**
CONDUCTIVITY	**µS/cm** (µS/sm)	**724**	**SM 2510 B**	**2500**	**25^{0}C 1500**
TOTAL HARDNESS	**mq/L $CaCO_3$**	**213**	**SM 2340 C**		**<7 mg/ekv*L**
TOTAL ORGANIC CARBON	**mq/L** (mg/L)	**1,2**	**SM 5310 C**		
T. ALKALINITY	**mq/L** (mg/L)	**122**	**SM 2320 B**		
CARBONATE	**mq/L** (mg/l)	**10**	**SM 2320 B**		
BICARBONATE	**mq/L** (mg/l)	**112**	**SM 2320 B**		
(Ca^{2+}) (Calcium)	**mq/L** (mg/L)	**47**	**EN İSO 14911**		**until250 mg/l**
(Mg^{2+}) (Magnesium)	**mq/L** (mg/L)	**19,4**	**EN İSO 14911**		**until50 mg/L**
(NH_4^+) (Ammonium)	**mq/L** (mg/L)	**<0,12**	**EN İSO 14911**	**0.5**	
(Na^+) (Sodium)	**mq/L** (mg/L)	**60**	**EN İSO 14911**	**200**	
(K^+) (Potassium)	**mq/L** (mg/L)	**2,1**	**EN İSO 14911**		
(Li^+) (Lithium)	**mq/L** (mg/L)	**<0,15**	**EN İSO 14911**		
(Cl^-) (Chloride)	**mq/L** (mg/L)	**64,2**	**SM 4110 B**	**250**	**350**
(SO_4^{2-}) (Sulfate)	**mq/L** (mg/L)	**116**	**SM 4110 B**	**250**	**500**

PARAMETER	Unit	Result	method	QUALITY REQUIREMENTS	
				98/83 EC Directive	QOST 2874-82
(NO_3^-) (Nitrate)	**mq/L** (mg/L)	**1,1**	**SM 4110 B**	**50**	**45**
(F^-) (Fluoride)	**mq/L** (mg/L)	**0,2**	**SM 4110 B**	**1,5**	**0,7**
(NO_2^-) (Nitrite)	**mq/L** (mg/L)	**0,04**	**SM 4110 B**	**0,5**	**нет**
(Br^-) (Bromide)	**mq/L** (mg/L)	**<0,15**	**SM 4110 B**		
(PO_4^{3-}) (Phosphate)	**mq/L** (mg/L)	**0,06**	**SM 4110 B**		**<3,5**
(Cyanide)	**mq/L** (mg/L)	**<0,01**	**DR 3900 Kit Method**	**0,05**	
Al (Alüminium)	**µq/L** (µg/L)	**4.22**	**SM 3111 D**	**200**	**<0.5 mg/L**
As (Arsen)	**µq/L** (µg/L)	**<1**	**SM 3114 B**	**10**	**50**
Be (Berilium)	**µq/L** (µg/L)	**<1**	**SM 3111 D**		**0,2**
Ba (Barium)	**µq/L** (µg/L)	**30,5**	**SM 3120B**		
Cd (Kadmium)	**µq/L** (µg/L)	**<1**	**SM 3111 B**	**5**	
Cr (Chromium)	**µq/L** (µg/L)	**<1**	**SM 3111 B**	**100**	
Cu (Copper)	**mq/L** (mg/L)	**4.91**	**SM 3111 B**	**2**	**1**
Pb (Lead)	**µq/L** (µg/L)	**17,1**	**SM 3111 B**	**15**	**30**
Se (Selenium)	**µq/L** (µg/L)	**<1**	**SM 3114 B**	**10**	**1**
Va (Vanadium)	**µq/L** (µg/L)	**<1**	**SM 3111 D**		
Zn (Zinc)	**mq/L** (mg/L)	**23.6**	**SM 3111 B**		**5000**
Fe (İron)	**µq/L** (µg/L)	**19**	**SM 3111 B**	**200**	**0,3 mg/L**
Ag (Argentium)	**µq/L** (µg/L)	**<1**	**SM 3120 B**		
Li (Lithium)	**µq/L** (µg/L)	**13,5**	**SM 3120 B**		
Co (Cobalt)	**µq/L** (µg/L)	**<1**	**SM 3120 B**		

PARAMETER	Unit	Result	method	QUALITY REQUIREMENTS	
				98/83 EC Directive	QOST 2874-82
Mg (Manganese)	**µq/L** (µg/L)	**<1**	**SM 3111 B**	**50**	**100**
Ni (Nickel)	**µq/L** (µg/L)	**1.45**	**SM 3111 B**	**20**	
Rb (Rubidium)	**µq/L** (µg/L)	**<1**	**SM 3120**		
Cs (Cesium)	**µq/L** (µg/L)	**<1**	**SM 3120**		
Sr (Strontium)	**µq/L** (µg/L)	**473**	**SM 3120**		**7000**
Tl (Thallium)	**µq/L** (µg/L)	**<1**	**SM 3120**		

Results after cleaning

PARAMETER	Unit	Result	method	QUALITY REQUIREMENTS	
				98/83 EC Directive	QOST 2874-82
pH	**pH** (pH unit)	**8,29**	**SM 4500-H*B**	6,5-9,5	**6,0-9,0**
TURBIDITY	**NTU**	**1**	**SM 2130 B**	1	**1,5 mg/L**
CONDUCTIVITY	**µS/cm** (µS/sm)	**711**	**SM 2510 B**	**2500**	**25^{0}C 1500**
TOTAL HARDNESS	**mq/L** (mg/L)	**204**	**SM 2340 C**		**<7mg/ek *L**
TOTAL ORGANIC CARBON	**mq/L** (mg/L)	**1,1**	**SM 5310 C**		
T. ALKALINITY	**mq/L** (mg/L)	**112**	**SM 2320 B**		
CARBONATE	**mq/L** (mg/L)	**8**	**SM 2320 B**		
BICARBONATE	**mq/L** (mg/L)	**104**	**SM 2320 B**		
(Ca^{2+}) (Calcium)	**mq/L** (mg/L)	**44**	**EN İSO 14911**		**until250 mg/l**
(Mg^{2+}) (Magnesium)	**mq/L** (mg/L)	**16,3**	**EN İSO 14911**		**until50 mg/L**

(NH_4^+) (Ammonium)	**mq/L** (mg/L)	**<0,12**	**EN İSO 14911**	**0.5**	
(Na^+) (Sodium)	**mq/L** (mg/L)	**52**	**EN İSO 14911**	**200**	
(K^+) (Potassium)	**mq/L** (mg/L)	**2**	**EN İSO 14911**		
(Li^+) (Lithium)	**mq/L** (mg/L)	**<0,15**	**EN İSO 14911**		
(Cl^-) (Chloride)	**mq/L** (mg/L)	**55,6**	**SM 4110 B**	**250**	**350**
(SO_4^{2-}) (Sulfate)	**mq/L** (mg/L)	**108**	**SM 4110 B**	**250**	**500**
(NO_3^-) (Nitrate)	**mq/L** (mg/L)	**1**	**SM 4110 B**	**50**	**45**
(F^-) (Fluoride)	**mq/L** (mg/L)	**0,04**	**SM 4110 B**	**1,5**	**0,7**
(NO_2^-) (Nitrite)	**mq/L** (mg/L)	**0,02**	**SM 4110 B**	**0,5**	**нет**
(Br^-) (Bromide)	**mq/L** (mg/L)	**<0,15**	**SM 4110 B**		
(PO_4^{3-}) (Phosphate)	**mq/L** (mg/L)	**0,02**	**SM 4110 B**		**<3,5**
(Cyanide)	**mq/L** (mg/L)	**<0,01**	**DR 3900 Kit Metodu**	**0,05**	
Al (Alüminium)	**µq/L** (µg/L)	**4,1**	**SM 3111 D**	**200**	**<0.5 mg/L**
As (Arsen)	**µq/L** (µg/L)	**<1**	**SM 3114 B**	**10**	**50**
Be (Berilium)	**µq/L** (µg/L)	**<1**	**SM 3111 D**		**0,2**
Ba (Barium)	**µq/L** (µg/L)	**27,3**	**SM3120 B**		
Cd (Kadmium)	**µq/L** (µg/L)	**<1**	**SM 3111 B**	**5**	
Co (Cobalt)	**µq/L** (µg/L)	**<1**	**SM 3120 B**		
Cr (Chromium)	**µq/L** (µg/L)	**<1**	**SM 3111 B**	**100**	
Cu (Copper)	**mq/L** (mg/L)	**4.3**	**SM 3111 B**	**2**	**1**
Pb (Lead)	**µq/L** (µg/L)	**4,15**	**SM 3111 B**	**15**	**30**
Se (Selenium)	**µq/L** (µg/L)	**<1**	**SM 3114 B**	**10**	**10**

Va (Vanadium)	**µq/L** (µg/L)	**<1**	**SM 3111 D**		
Zn (Zinc)	**mq/L** (mg/L)	**15,2**	**SM 3111 B**		**5**
Fe (İron)	**µq/L** (µg/L)	**6,22**	**SM 3111 B**	**200**	**0,3 mg/L**
Ag (Argentium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		
Li (Lithium)	**µq/L** (µg/L)	**8,5**	**SM 3120 B**		
Mg (Manganese)	**µq/L** (µg/L)	**<1**	**SM 3111 B**	**50**	**100**
Ni (Nickel)	**µq/L** (µg/L)	**1.1**	**SM 3111 B**	**20**	
Rb (Rubidium)	**µq/L** (µg/L)	**<1**	**SM 3120**	**10**	**30**
Cs (Cesium)	**µq/L** (µg/L)	**<1**	**SM 3120 B**		

Sampling in winter period

Results before cleaning18.01.2016

PARAMETER	**Unit**	**Result**	**method**	**QUAILITY REQUIREMENTS**	
				98/83 EC Directive	**QOST 2874-82**
PH	**pH** (pH unit)	**8,30**	**SM 4500-H*B**	6,5-9,5	**6,0-9,0**
TURBIDITY	**NTU**	**7,6**	**SM 2130 B**	1	**1,5 mg/L**
CONDUCTIVITY	**µS/cm** (µS/sm)	**635**	**SM 2510 B**	**2500**	**25^{0}C 1500**
TOTAL HARNESS	**mq/L $CaCO_3$**	**194**	**SM 2340 C**		**<7mg/ekv *L**
CARBONATE	**mq/L** (mg/L)	**22**	**SM 2320 B**		
BICARBONATE	**mq/L** (mg/L)	**107**	**SM 2320 B**		
T. ALKALINITY	**mq/L** (mg/L)	**129**	**SM 2320 B**		
TOTAL ORGANIC CARBON	**mq/L** (mg/L)	**1,5**	**SM 5310 C**		
(Ca^{2+}) (Calcium)	**mq/L** (mg/L)	**45**	**EN ISO 14911**		**until 250mg/L**

PARAMETER	Unit	Result	method	QUAILITY REQUIREMENTS	
				98/83 EC Directive	QOST 2874-82
(Mg^{2+}) (Magnesium)	**mq/L** (mg/L)	**19,8**	**EN ISO 14911**		**Until 50mg/L**
(NH_4^+) (Ammonium)	**mq/L** (mg/L)	**<0,14**	**EN ISO 14911**	0,5	
(Na^+) (Sodium)	**mq/L** (mg/L)	**56**	**EN ISO 14911**	**200**	
(K^+) (Potassium)	**mq/L** (mg/L)	**2,6**	**EN ISO 14911**		
(Li^+) (Lithium)	**mq/L** (mg/L	**<0,15**	**EN ISO 14911**		
(SO_4^{2-}) (Sulfate)	**mq/L** (mg/L)	**68**	**SM 4110 B**	**250**	**500**
(NO^{3-}) (Nitrate)	**mq/L** (mg/L)	**18**	**SM 4110 B**	**50**	**45**
(Cl^-) (Chloride)	**mq/L** (mg/L)	**66**	**SM 4110 B**	**250**	**350**
Al (Aluminum)	**µq/L** (µg/L)	**102,7**	**SM 3120B**	**200**	**<500**
As (Arsen)	**µq/L** (µg/L)	**<1**	**SM 3120B**	**10**	**50**
Ba (Barium)	**µq/L** (µg/L)	**35,5**	**SM 3120B**		
Be (Berilium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		**0,2**
Fe (İron)	**µq/L** (µg/L)	**73,3**	**SM 3120B**	**200**	**300**
Ag (Argentium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		
Li (Lithium)	**µq/L** (µg/L)	**14,1**	**SM 3120B**		
Cd (Kadmium)	**µq/L** (µg/L)	**<1**	**SM 3120B**	**5**	
Co (Cobalt)	**µq/L** (µg/L)	**<1**	**SM 3120B**		
Mg (Manganese)	**µq/L** (µg/L)	**23**	**SM 3120B**	**50**	**100**
Cu (Copper)	**µq/L** (µg/L)	**3,8**	**SM 3120B**	**2000**	**1000**
Ni (Nickel)	**µq/L** (µg/L)	**<1**	**SM 3120B**	**20**	
Pb (Lead)	**µq/L** (µg/L)	**3,2**	**SM 3120B**	**10**	**30**

PARAMETER	Unit	Result	method	QUAILITY REQUIREMENTS	
				98/83 EC Directive	QOST 2874-82
Rb (Rubidium)	**µq/L** (µg/L)	**1,2**	**SM 3120B**		
Se (Selenium)	**µq/L** (µg/L)	**<1**	**SM 3120B**	**10**	**10**
Cs (Cesium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		
Zn (Zinc)	**µq/L** (µg/L)	**3,3**	**SM 3120B**		**5000**
Sr (Strontium)	**µq/L** (µg/L)	**552**	**SM 3120B**		**7000**
Tl (Thallium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		
Cr (Chromium)	**µq/L** (µg/L)	**<1**	**SM 3120B**	**100**	
Va (Vanadium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		

Results after cleaning

PARAMETER	Unit	Result	method	QUALITY REQUIREMENTS	
				98/83 EC Directive	QOST 2874-82
pH	**pH** (pH unit)	**8,16**	**SM 4500-H*B**	6,5-9,5	**6,0-9,0**
TURBIDITY	**NTU**	**1,9**	**SM 2130 B**	1	**1,5 mg/L**
CONDUCTIVITY	**µS/cm** (µS/sm)	**612**	**SM 2510 B**	**2500**	**25^0C də 1500**
TOTAL HARDNESS	**mq/L $CaCO_3$**	**174**	**SM 2340 C**		**<7mg/ekv* L**
CARBONATE	**mq/L** (mg/L)	**18**	**SM 2320 B**		
BICARBONATE	**mq/L** (mg/L)	**95**	**SM 2320 B**		
T. ALKALINITY	**mq/L** (mg/L)	**113**	**SM 2320 B**		
TOTALORGANIC CARBON	**mq/L** (mg/L)	**1,2**	**SM 5310 C**		

PARAMETER	Unit	Result	method	QUALITY REQUIREMENTS	
				98/83 EC Directive	QOST 2874-82
(Ca^{2+}) (Calcium)	**mq/L** (mg/L)	**40**	**EN ISO 14911**		**Until 250 mg/L**
(Mg^{2+}) (Magnesium)	**mq/L** (mg/L)	**16,2**	**EN ISO 14911**		**Until 50 mg/L**
(NH_4^+) (Ammonium)	**mq/L** (mg/L)	**<0,14**	**EN ISO 14911**	**0,5**	
(Na^+) (Sodium)	**mq/L** (mg/L)	**42**	**EN ISO 14911**	**200**	
(K^+) (Potassium)	**mq/L** (mg/L)	**<1,3**	**EN ISO 14911**		
(Li^+) (Lithium)	**mq/L** (mg/L)	**<0,15**	**EN ISO 14911**		
(SO_4^{2-}) (Sulfate)	**mq/L** (mg/L)	**52**	**SM 4500 SO_4^{2-} E**	**250**	**500**
(NO_3^-) (Nitrate)	**mq/L** (mg/L)	**14**	**SM 4500 NO_3^- B**	**50**	**45**
(Cl^-) (Chloride)	**mq/L** (mg/L)	**61**	**SM 4500 Cl^- B**	**250**	**350**
Al (Aluminium)	**µq/L** (µg/L)	**73,6**	**SM 3120B**	**200**	**<500**
As (Arsen)	**µq/L** (µg/L)	**<1**	**SM 3120B**	**10**	**50**
Ba (Barium)	**µq/L** (µg/L)	**32,4**	**SM 3120B**		
Be (Berilium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		**0,2**
Fe (İron)	**µq/L** (µg/L)	**20,5**	**SM 3120B**	**200**	**300**
Ag (Argentium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		
Li (Lithium)	**µq/L** (µg/L)	**11,2**	**SM 3120B**		
Cd (Kadmium)	**µq/L** (µg/L)	**<1**	**SM 3120B**	**5**	
Co (Cobalt)	**µq/L** (µg/L)	**<1**	**SM 3120B**		
Mg (Manganese)	**µq/L** (µg/L)	**1,1**	**SM 3120B**	**50**	**100**
Cu (Copper)	**µq/L** (µg/L)	**1,8**	**SM 3120B**	**2000**	**1000**
Ni (Nickel)	**µq/L** (µg/L)	**<1**	**SM 3120B**	**20**	

PARAMETER	Unit	Result	method	QUALITY REQUIREMENTS	
				98/83 EC Directive	QOST 2874-82
Pb (Lead)	**µq/L** (µg/L)	**1,6**	**SM 3120B**	**10**	**30**
Rb (Rubidium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		
Se (Selenium)	**µq/L** (µg/L)	**<1**	**SM 3120B**	**10**	**10**
Cs (Cesium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		
Zn (Zinc)	**µq/L** (µg/L)	**1,4**	**SM 3120B**		**5000**
Sr (Strontium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		**7000**
Tl (Thallium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		
Cr (Chromium)	**µq/L** (µg/L)	**<1**	**SM 3120B**	**100**	
Va (Vanadium)	**µq/L** (µg/L)	**<1**	**SM 3120B**		

Comparing the results before and after treatment , we can see that the amount of different parameters are decreasing. There was not found parameters which are exceed the maximum allowable concentration.

CONCLUSIONS

On the basis of physico-chemical analysis of drinking water of Ceyranbatan reservoir that were carried out during 2015-2016 in the autumn and winter periods we can draw the following conclusions:

1. Water samples showed good organoleptic properties.
2. Physico-Chemical water indicators comply with the drinking-water quality standards.
3. It is pointed out that it was not detected excess amounts of heavy metals in water.
4. Analyzed water samples comply with all standards and hygienic requirements for the quality of drinking water, demonstrating a highly efficient operation of the Ceyranbatan water treatment plant.

REFERENCES

1.Standard Methods: 4500-H+B: pH in Water by Potentiometry

2. Standard Methods: 2130 B: Turbidity by Nephelometry

3.Standard Methods: 2510B: Conductivity - Laboratory Method

4.Standard Methods: 2340C: EDTA Titrimetric Method (Hardness)

5.Standard Methods: 2320 B: Alkalinity by Titration

6.Standard Methods: 4110B: Anions in Water by Ion Chromatography

7. Standard Methods: 3500B: Cations in Water by Ion Chromatography

8.Standard Methods: 3125B: Metals in Water by ICP/MS

9.Standard Methods: 5310C: Total organic carbon by Persulfate-UV or Heated-Persulfate Oxidation Method.

10. Archangel VI, Melnichenko PI Health: A Training Manual -2012.

11. Archangel VI, Melnichenko PI Health with the basics of human ecology: a tutorial -2010.

12.Bolshakov AM General Hygiene: Medicine 2002.

13. EA Volkov Cultural properties of enterobacteria on diagnostic media // Veterinary Medicine. - 2009.

14. GOST 17.1.05-85. Protection of Nature. Hydrosphere. General requirements for sampling of surface and sea waters, ice and atmospheric precipitation.

15. Environmental health 2003.

16. Melnichenko PI Hygiene with the basics of human ecology: GEOTAR-Media, 2010.

17. Guidelines for quality assurance of the WHO drinking water 2001.

18. Sadchikov AP Self-purification of water bodies with coastal-water plant in 2013.

19. 2.1.4.1074-01 SanPiN "Hygienic requirements and drinking water quality standards," Russian Ministry of Health, Moscow, 2003.

20. SanPiN2.1.5.980-00. Wastewater populated areas, sanitary protection of water bodies. Hygienic requirements for surface water protection -Moscow 2000.

21. SanPiN 2.1.4.1074-01. Drinking water. Hygienic requirements for water quality of centralized drinking water supply systems.

Internet resources:

22.http://www.advantour.com/rus/azerbaijan/nabran.htm.

23.http://www.azerbaijans.com/content_1364_ru

24.http://www.aqua-stars.ru/about/articles/articles_11.html

25. http://www.kolodec.ru/vo/43/ water quality and its composition.

26.http://www.medical-enc.ru/gigiena/gigienicheskoe-normirovanie-i-kontrol-za-kachestvom-pitevoi-vody.shtml.

27.http://studopedia.org/ Hygienic requirements for drinking water quality.

28. http://www.trend.az/azerbaijan/politics/2084402.html

29.http://chem21.info/info/1596464/ Природа воды.

30. http://www.vodainfo.com/ru/about_water/types_water.html Виды воды.

31.https://ru.wikipedia.org/wiki/Хачмазский_район

32.http://azersu.az/index.php?cat=112&ses=44d58

33.http://ingilizce-azerice.cevirsozluk.com/ceviri7/140872910-jeyranbatan-reservoir-that-inspired-settar

34.https://www.nemi.gov/methods/method_summary/5718/

35.http://www.tunaproje.com/en/projects/ceyranbatan-ultrafiltration-building

36.http://allianceneva.ru/interesnye_fakty_o_vode/pokazateli_kachestva_pitevojj_vody